2012 TEACHER'S GUIDE

GRADES 5th-7th

I. OBJECTIVE

Goals:

- Be informed that South Carolina has unhealthy air pollution at times.
- Identify and discuss the different types of air pollution.
- Identify and discuss the sources of air pollution.
- Discuss the effects of air pollution on people, animals, and the environment.
- Discuss ways to prevent or reduce air pollution and improve air quality.
- Draw a picture that depicts what we can do to have a positive affect on air quality.

II. SCIENCE STANDARDS

GRADE 5

5-2.2 Summarize the composition of an ecosystem, considering both biotic factors (including populations to the level of microorganisms and communities) and abiotic factors.
For example: Air is a critical piece to the ecosystem. Air is an abiotic factor. It is a non-living factor that is vital for a living (biotic) factor.

5-2.5 Explain how limiting factors (including food, water, space, and shelter) affect populations in ecosystems.
For example: Air is everywhere. Polluted air is a limiting factor that affects living things.

5-3.6 Explain how human activity (including conservation efforts and pollution) has affected the land and the oceans of Earth.
For example: Human activity (i.e. vehicle exhaust) is the leading contributor of air pollution. People recycle, carpool, ride bikes, don't burn trash, plant trees, and conserve energy.

5-4.1 Recall that matter is made up of particles too small to be seen.
For example: Air (a gas) transports particles (matter), you can't see it but it can cause health problems.

5-4.8 Explain how the mixing and dissolving of foreign substances is related to the pollution of the water, air, and soil.
For example: Water is a liquid, air is a gas, and soil is a solid. Foreign substances can mix with the air and lead to pollution (i.e. small particles from burning)

GRADE 6

6-1.2 Differentiate between observation and inference during the analysis and interpretation of data.
For example: Demonstrate where you can observe air pollution, gather clues and make an inference about the source of the pollution. Suggested activities at the end can help with this.

6-3.4 Explain how environmental stimuli cause physical responses in animals (including shedding, blinking, shivering, sweating, panting, and food gathering).
For example: Compare the differences between animal and human response to pollutants in the environment (sneezing, coughing, skin/eye irritation, sweating, panting).

6-4.1 Compare the composition and structure of Earth's atmospheric layers (including the gases and differences in temperature and pressure within the layers).
For example: Differentiate between ozone located in the Earth's two layers-stratosphere and troposphere. Explain why it is "good up high and bad near by."

GRADE 7

7-3.2 Recall the major organs of the human body and their function within their particular body system.
For example: Make analogies in nature (i.e. why we have plants in nature or in a classroom). They act as "air purifiers" for our respiratory system.

7-3.4 Explain the effects of disease on the major organs and body systems (including infectious diseases such as colds and flu, AIDS, and athlete's foot and noninfectious diseases such as diabetes, Parkinson's, and skin cancer).
For example: Discuss the effects of air pollution on people with existing respiratory conditions such as asthma, bronchitis and emphysema)

7-4.3 Explain the interaction among changes in the environment due to natural hazards (including landslides, wildfires, and floods), changes in populations, and limiting factors (including climate and the availability of food and water, space, and shelter).
For example: Explain the relationship between air pollution and wild fire or air pollution and acid rain.

7-5.1 Recognize that matter is composed of extremely small particles called atoms.
For example: Explain the chemical nature of matter. Gas a form of matter.

7-5.2 Classify matter as element, compound, or mixture on the basis of its composition.
For example: Use air to classify matter (i.e. air is a mixture of gases)

7-5.10 Compare physical changes (including changes in size, shape, and state) to chemical changes that are the result of chemical reactions (including changes in color or temperature and formation of a precipitate or gas).
For example: Air can become hot, cold, it can expand, and contract and change states and forms a precipitate such as acid rain.

III. METHOD

CLASSROOM INTRODUCTION

- Tell your class that people, animals and plants can live only if certain basic needs are met. The four basic needs of all living things are sunlight, air, water and soil.
- Clean air is a vital factor for all living things.
- Explain that air enters the body through the lungs. Air is a mixture of various elements (nitrogen, oxygen, water, carbon dioxide). The oxygen in air keeps our bodies alive.
- Explain that when we breathe clean air, our bodies stay healthy. But, when we breathe dirty (polluted) air, it can make us sick.
- Explain that the air outside is not always clean.
- Tell the class that today they are going to learn about how air pollution affects their health.

GROUP DISCUSSION

1. Our planet is surrounded by a sea of gases we call the atmosphere. The Earth's atmosphere is made up of a number of layers. The two closest to the Earth are the stratosphere and the troposphere. The stratosphere layer protects us from sunburn and harmful ultraviolet rays. The layer closet to the Earth's surface is the troposphere. The air we breathe is part of the troposphere. Unfortunately, pollutants are also in our air.

2. Air pollutants are what make the air dirty and cause air pollution. These pollutants affect human health, crops, livestock, vegetation, buildings, and visibility. Two of the most common air pollutants: Ground-Level Ozone and Particulate Matter, make up most air pollution.

- **Ozone (O_3) -** can be good or bad. It all depends on where it is. Ozone is good when it is high up in the stratosphere. Ozone is bad when it is near the ground (troposphere) where we breathe it in. You can't see ozone in the air. It is formed by other air pollutants reacting with sunlight. *Remember: "Good Up High, Bad Near By"*

- **Particulate matter (PM)** - is small pieces of solid materials such as soot, dust, ash or tiny droplets of liquid. Particulates come from burning fuels such as wood, coal, oil, and gasoline. Large amounts of these particles can cause haze and lower visibility.

  Gases and particulate matter from volcanic eruptions and soot from forest fires are known as natural sources of air pollution. Human-made sources of air pollution come from burning fuels. Fuels are used to run automobiles, factories, and power plants. A primary source of air pollution is transportation, or mobile sources.

3. Air pollution is caused by activities that people and machines do every day. The more air is polluted the bigger the impact on an ecosystem. Can you think of some causes of air pollution? *(Answers can include the following)*

- Driving cars

- Wasting electricity
- Factory Emissions
- Burning trash
- Fires
- Flying Planes
- Using chemicals (paints, pesticides, household products)

4. Breathing dirty air can have many bad effects on people. It can make you feel sick and hurt your lungs. Dirty air can also cause damage to plants and animals. Have you ever felt sick or have trouble breathing on a hot day? How did you feel? *(Answers can include the following)*

- Irritated eyes
- Sore throat
- Cough
- Headache
- Chest tightness
- Shortness of breath
- Wheezing
- Feel tired
- Nausea

5. There are things you can do to reduce air pollution. What are some things you can do to help keep the air clean? *(Answers can include the following)*

- Ride a bike, skateboard, or scooter when possible
- Walk
- Take the bus instead of car
- Don't waste electricity
- Carpool with other students
- Ask parents to combine errands into one trip
- Reduce, Reuse, Recycle
- Don't use spray products
- Plant trees
- Ask parents not to idle their vehicles
- Ask parents to use electric lawn and garden equipment
- Don't burn trash or debris
- Encourage your parents to buy fuel-efficient cars
- Encourage your parents to buy energy efficient appliances

6. SUPPLEMENTARY ACTIVITIES

Here are some activities you can do to follow up and reinforce clean air messages presented in this guide.

a. Collect samples of air pollution

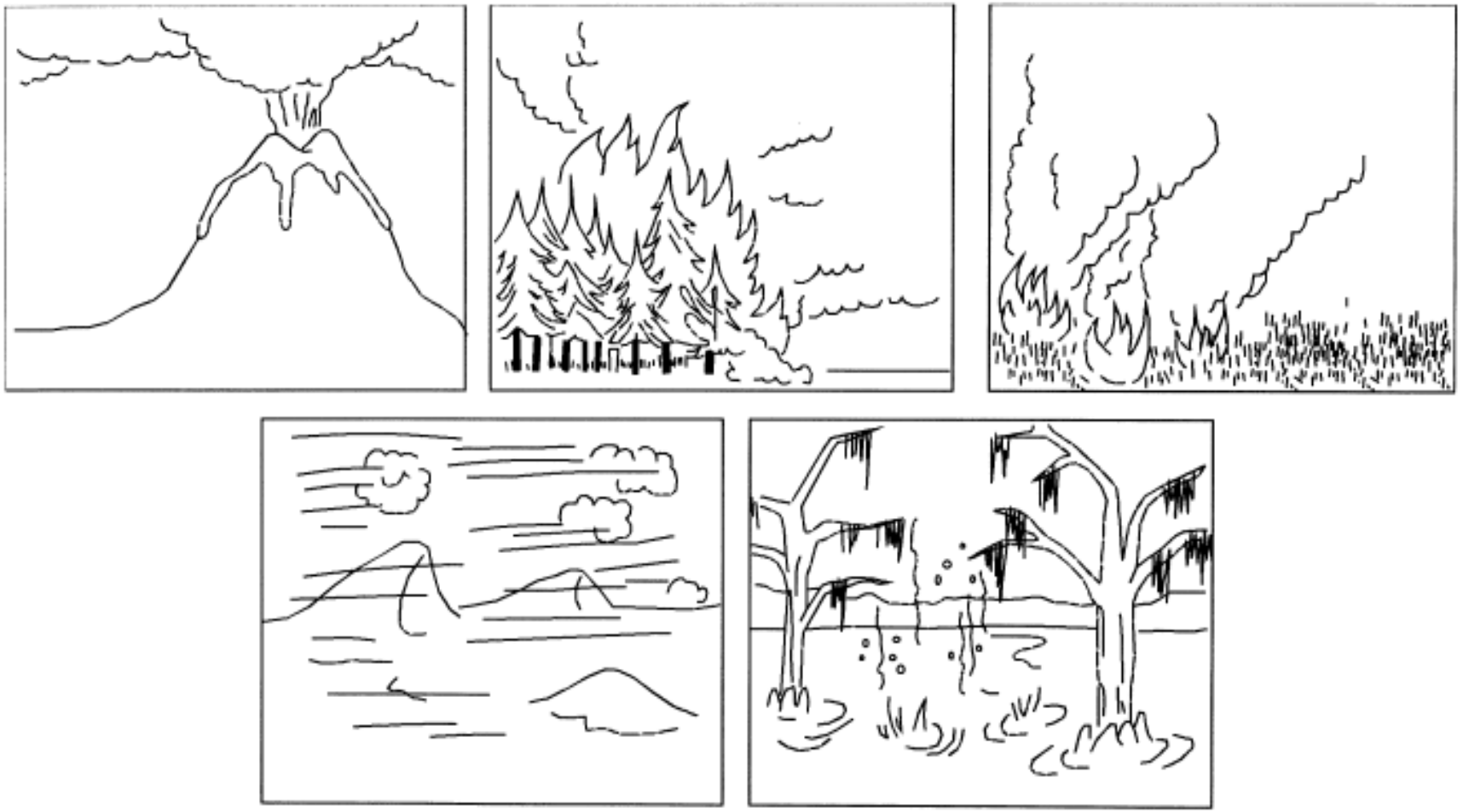
Set either a wide-mouth collection jar of water or a Vaseline coated plate or index card outside near the classroom. Examine the container periodically to see signs of air pollution. You can also set various glasses around the school to witness air pollution in different settings (i.e. near the car/bus pick up area, in a garden, near trees, etc.)

b. Car count for single occupant vehicles
Take your class to a place near the school where they can observe traffic. Divide the class into small groups. Have each group count and record the number of cars with only one person inside them that drive by a designated spot. Let them count cars for ten minutes. Following the activity, discuss how carpooling or taking the bus would have reduced the total number of cars on the road and air pollution emissions.

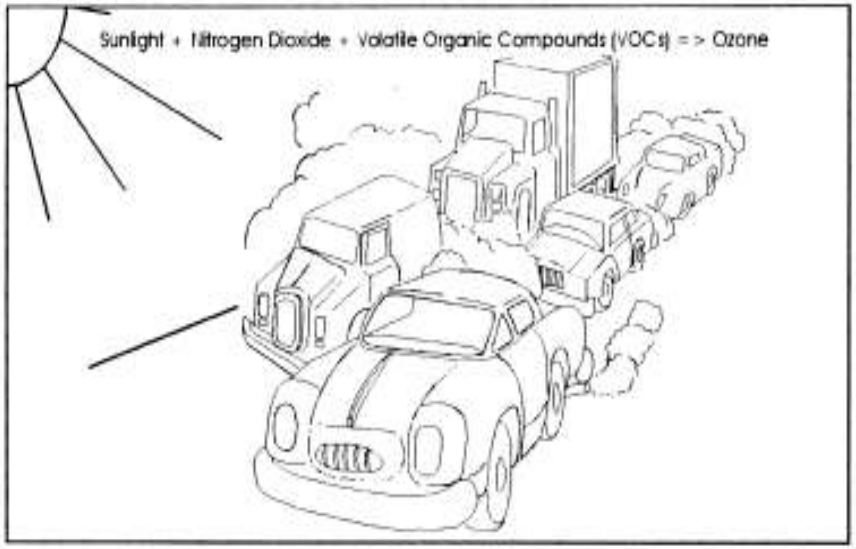
c. Make the link between good air and the need for trees
Go out to a tree with large leaves on the school grounds. Clean off a few of the leaves and then coat the leaves with Vaseline. Observe how much pollution is left on the leaf over time. Discuss with your class how the tree would have absorbed that pollution and helped clean the air. This can expand into a larger service project of planting trees or starting a garden.

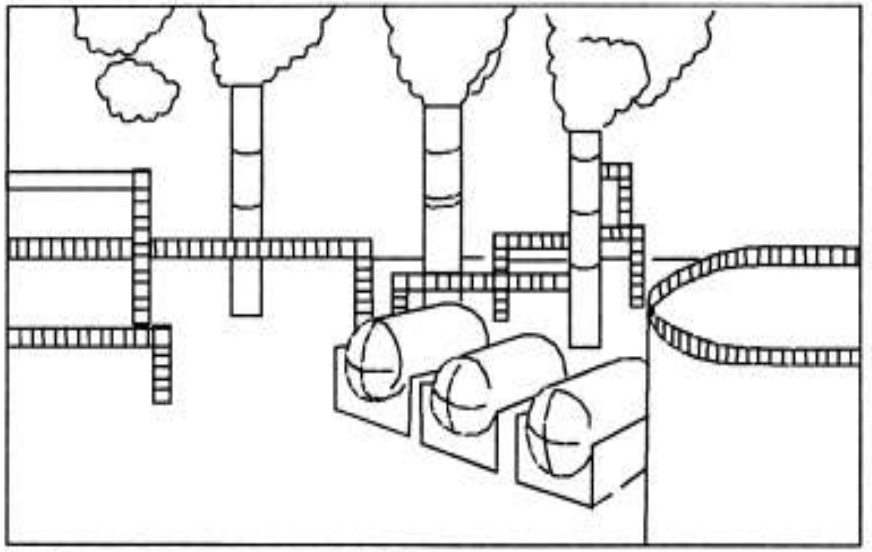
d. During the Ground Level Ozone Season (April 1st- October 1st) ask students to look for daily smog levels in the weather and report every day for a week. Watch TV, read the newspaper or call the S.C. DHEC's Ozone Hotline at 1-866-238-4973. Record the highest air pollution number each day on the chart. Have class discuss how to protect their health on unhealthy air days.

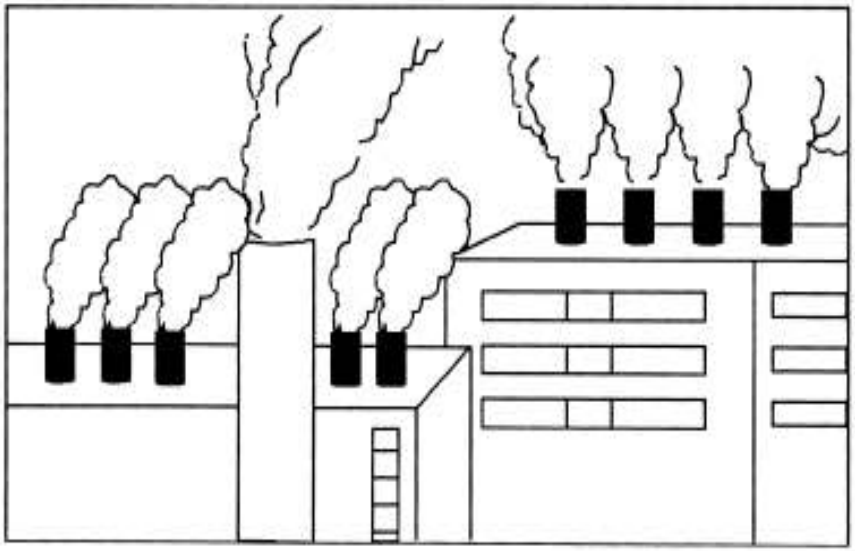
Natural Sources of Air Pollutants



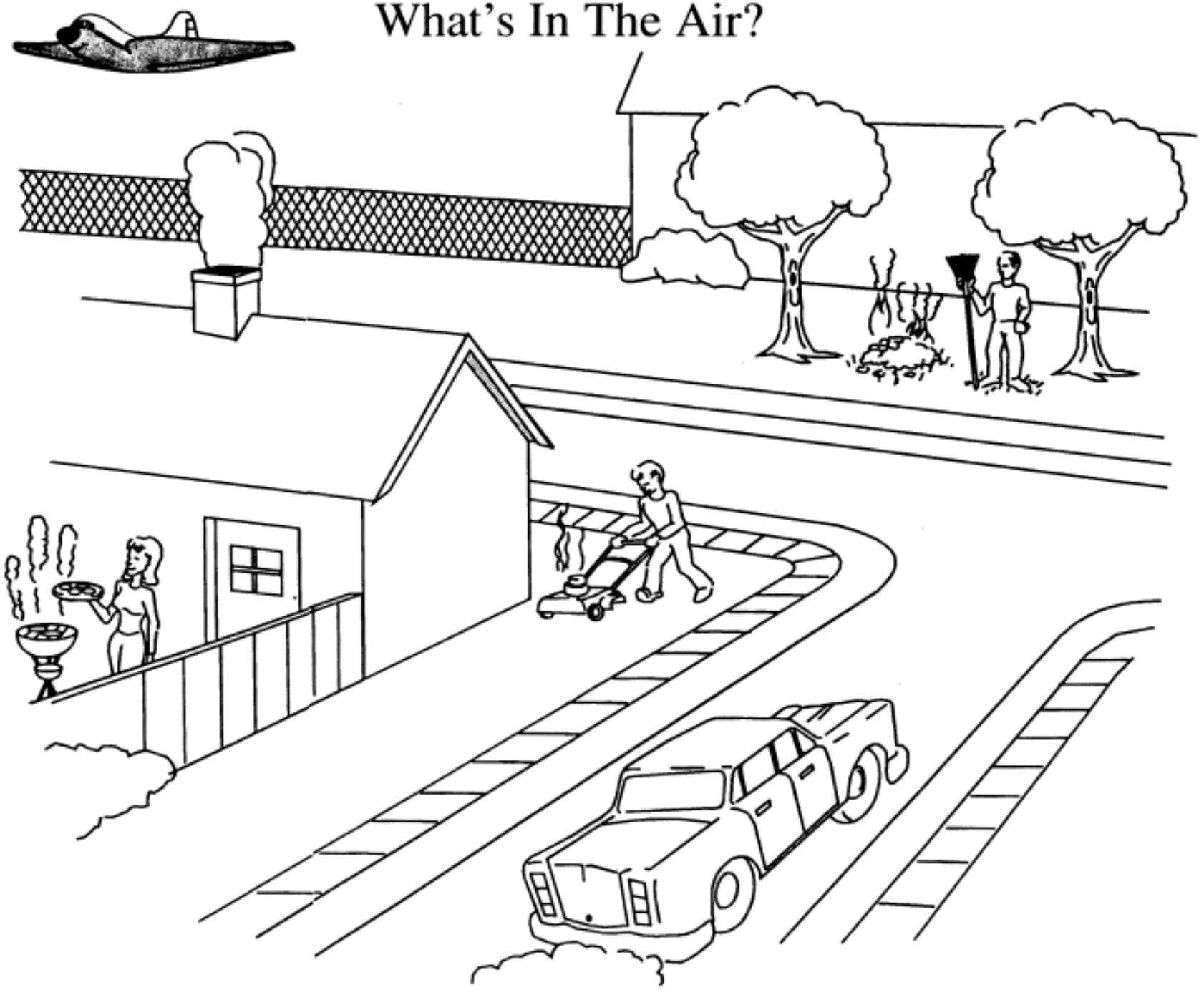
Human-Generated Sources of Air Pollutants







What's In The Air?



The Air Quality Index, or AQI, is used to tell us how healthy the air is to breathe each day. Hold up the AQI attachment and discuss the AQI colors and their meanings with students. Tell students that each day the air quality is one of these colors. The colors go from Green to Yellow to Orange to Red to Purple to Maroon with each color telling you that the air is less clean than the color before.

*Note: An AQI of Orange, Red, Purple, or Maroon is also known as an "Ozone Action Day".

Air Quality Index Levels of Health Concern	Meaning
Good	Air quality is considered satisfactory, and air pollution poses little or no risk
Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	Health alert: everyone may experience more serious health effects